CLAIMS

[Claim 1]

A delivery plan making system for making a delivery plan of an article, the system comprising:

a storage unit that stores a restriction condition for making a delivery plan and cost information used for calculating a delivery cost based on the delivery plan;

a delivery plan making and cost calculating unit that makes a delivery plan before alleviation of the restriction condition to satisfy the restriction condition and calculates a delivery cost of the delivery plan before the alleviation based on the cost information; and

a restriction alleviating unit that generates a restriction alleviation plan by alleviating the restriction conditions, wherein

the delivery plan making and cost calculating unit further makes a delivery plan after alleviation of the restriction condition to satisfy the restriction alleviation plan and calculates a delivery cost of the delivery plan after the alleviation based on the cost information, and

outputs the restriction alleviation plan if the delivery cost of the delivery plan after the alleviation is lower than the delivery cost of the delivery plan before the alleviation; wherein

the storage unit further stores a restriction alleviation condition indicating a maximum alleviation amount of the restriction condition,

the delivery plan making and cost calculating unit makes a restriction alleviation plan in which the restriction condition is alleviated up to the maximum alleviation amount to make a delivery plan after the alleviation, and calculates a delivery cost of the delivery plan after the alleviation based on the cost information, and

if the delivery cost of the delivery plan after the alleviation is lower than the delivery cost of the delivery plan before the alleviation, the delivery plan making and cost calculating unit makes one or more restriction alleviation plans in which the restriction condition is alleviated up to an alleviation amount smaller than the maximum alleviation amount to make one or more delivery plans after the alleviation, and calculates delivery costs of the one or more delivery plans after the alleviation based on the cost information;

wherein

the restriction alleviation condition includes a pitch width of an alleviation amount, and

the delivery plan making and cost calculating unit alleviates the restriction condition up to one or more alleviation amounts determined based on the pitch width to generate the one or more restriction alleviation plans.

[Claim 2]

The delivery plan making system according to claim 1, wherein

the restriction condition includes at least one of a delivery time of the articles to a delivery destination, an actual working time of a delivery worker, and a use condition of a road for delivery, and

the cost information includes at least one of a charge for use of a vehicle for delivery, an overtime wage of the delivery worker, and a toll of the road.

[Claim 3]

The delivery plan making system according to claim 2, wherein

the storage unit further includes delivery destination information indicating locations of one or more delivery destinations and an article amount to be delivered to each delivery destination, hub information indicating locations of one or more delivery hubs, speed information indicating a moving speed on a path where the vehicle travels, worker information indicating the actual working time of the delivery worker, vehicle information indicating a maximum load capacity of the vehicle, the delivery worker who uses the vehicle, and a time required to unload the articles from the vehicle, and

distance information indicating a travel distance between each of the hubs and each delivery destination and a travel distance between the respective delivery destinations, and

the delivery plan making and cost calculating unit makes the delivery plan before the alleviation and the delivery plan after the alleviation to satisfy the restriction condition and the restriction alleviation plan based on the delivery destination information, the hub information, the speed information, the worker information, and the distance information.

[Claim 4]

The delivery plan making system according to claim 2, further comprising

a display unit that displays a kind and an alleviation amount of the restriction condition alleviated in the restriction alleviation plan and a cost of the delivery plan after the alleviation.

[Claim 5]

The delivery plan making system according to claim 4, wherein

the display unit displays the kind and the alleviation amount of the restriction condition alleviated in the restriction alleviation plan and the cost of the delivery plan

after the alleviation by displaying a figure having a size corresponding to a size of the cost of the delivery plan after the alleviation at a position on a coordinate space corresponding to the alleviation amount of the restriction condition.

[Claim 6]

A delivery plan making method for making a delivery plan of articles by a computer system including a processor and a storage device connected to the processor, wherein

the storage device storing a restriction condition for making a delivery plan and cost information used for calculating a delivery cost based on the delivery plan, and

the delivery plan making method comprising:

a first process where the processor makes a delivery plan before alleviation of the restriction condition to satisfy the restriction condition and allowing the processor to calculate a delivery cost of the delivery plan before the alleviation based on the cost information;

a second process where the processor generates a restriction alleviation plan by alleviating the restriction condition;

a third process where the processor makes a delivery plan after alleviation of the restriction condition so as to satisfy the restriction alleviation plan, and calculates a delivery

cost of the delivery plan after the alleviation based on the cost information, and

a fourth process where the processor outputs the restriction alleviation plan if the delivery cost of the delivery plan after the alleviation is lower than the delivery cost of the delivery plan before the alleviation;

wherein

the storage device further stores a restriction alleviation condition indicating a maximum alleviation amount of the restriction condition,

the second process includes a process where the processor generates a restriction alleviation plan in which the restriction condition is alleviated up to the maximum alleviation amount, and

the third process includes

a process where the processor makes a delivery plan after the alleviation to satisfy the restriction alleviation plan in which the restriction condition is alleviated up to the maximum alleviation amount, and calculates a delivery cost of the delivery plan after the alleviation based on the cost information, and

a process where, if the delivery cost of the delivery plan after the alleviation is lower than the delivery cost of the delivery plan before the alleviation, the processor generates one or more restriction alleviation plans in which

the restriction condition is alleviated up to an alleviation amount smaller than the maximum alleviation amount to make one or more delivery plans after the alleviation, and calculates delivery costs of the one or more delivery plans after the alleviation based on the cost information;

wherein

the restriction alleviation condition includes a pitch width of an alleviation amount, and

the third process includes a process where the processor generates the one or more restriction alleviation plans by alleviating the restriction condition up to one or more alleviation amounts determined based on the pitch width.

[Claim 7]

The delivery plan making method according to claim 6, wherein

the restriction condition includes at least one of a delivery time of the articles to a delivery destination, an actual working time of a delivery worker, and a use condition of a road for delivery, and

the cost information includes at least one of a charge for use of a vehicle for delivery, an overtime wage of the delivery worker, and a toll of the road.

[Claim 8]

The delivery plan making method according to claim 7, wherein

the storage device further includes delivery destination information indicating locations of one or more delivery destinations and an article amount to be delivered to each delivery destination, hub information indicating locations of one or more delivery hubs, speed information indicating a travel speed on a path where the vehicle travels, worker information indicating the actual working time of the delivery worker, vehicle information indicating a maximum load capacity of the vehicle, the delivery worker who uses the vehicle, and a time required to unload the articles from the vehicle, and distance information indicating a travel distance between each hub and each delivery destination and a travel distance between the respective delivery destinations,

the first process includes a process of making the delivery plan before the alleviation to satisfy the restriction condition based on the delivery destination information, the hub information, the speed information, the worker information, and the distance information, and

the third process includes a process of making the delivery plan after the alleviation to satisfy the restriction alleviation plan based on the delivery destination information, the hub information, the speed information, the worker information, and the distance information.

[Claim 9]

The delivery plan making method according to claim 7, wherein

the computer system further includes a display device connected to the processor, and

the fourth process includes a process where the display device displays a kind and an alleviation amount of the restriction condition alleviated in the restriction alleviation plan and a cost of the delivery plan after the alleviation.

[Claim 10]

The delivery plan making method according to claim 9,

wherein the fourth process includes a process where the display device displays the kind and the alleviation amount of the restriction condition alleviated in the restriction alleviation plan and the cost of the delivery plan after the alleviation by displaying a figure having a size corresponding to a size of the cost of the delivery plan after the alleviation at a position on a coordinate space corresponding to the alleviation amount of the restriction condition.